REMARKS/ARGUMENTS

Information Disclosure Statement

The Office Action states that there was no PTO-1449 form filed with the Information Disclosure Statement (IDS) filed on January 7, 2004. Applicants submitted a PTO-1449 form with the aforementioned IDS, as evidenced by the enclosed copy of the USPTO-stamped postcard receipt. A copy of the PTO-1449 form that accompanied the IDS is enclosed herewith. Applicants respectfully request acknowledgement of the Examiner's consideration of the references identified on the PTO-1449 form by return to Applicants of an Examiner-initialed copy of the PTO-1449 form.

The Pending Claims

The pending claims are directed to a method of chemical-mechanical polishing of a substrate. Claims 1-3, 6-10, 13-21, and 32-39 are currently pending. Reconsideration of the pending claims is respectfully requested.

Discussion of the Claim Amendments

Claim 31 has been canceled as being drawn to a nonelected species, in response to a restriction requirement.

Summary of the Office Action

The Office Action rejects claims 1-3, 6-9, 13, 14, 16-18, 20, 21, 32-34, and 36-39 under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent Application Publication 2002/0182982 A1 (Li et al.) (hereinafter "the Li '982 publication") in view of U.S. Patent Application Publication 2002/0086511 A1 (Hartner et al.) (hereinafter "the Hartner '511 publication"). The Office Action also rejects claims 10, 15, and 19 as allegedly unpatentable over the Li '982 publication in view of the Hartner '511 publication and further in view of U.S. Patent 6,454,822 (Rosenflanz) (hereinafter "the Rosenflanz '822 patent"). The Office Action further asserts that claim 35 is allegedly unpatentable over the Li '982 publication in view of the Hartner '511 publication and further in view of U.S. Patent 5,783,489 (Kaufman et al.) (hereinafter "the Kaufman '489 patent").

PAGE 10/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

Discussion of the Obviousness Rejection of Claims 1-3 ,6-9, 13, 14, 16-18, 20, 21, 32-34, and 36-39

The reflected claims are directed to a method of polishing a substrate comprising a noble metal oxide by use of a chemical-mechanical polishing system comprising a polishing compound (i.e., an abrasive, a polishing pad, or both), a particular reducing agent, and a liquid carrier.

The Office Action asserts that the Li '982 publication discloses a method of polishing a metal in an oxidized form, comprising contacting a portion of the metal with a polishing pad and a slurry comprising abrasive particles and a reducing agent (e.g., hydroxylamine). The Office Action acknowledges that the Li '982 publication fails to disclose that the metal in oxidized form may be a noble metal selected from a specified group, but asserts that such a method would be obvious in view of the Hartner '511 publication. The Hartner '511 publication is generally directed to a method for fabricating a patterned layer from a layer material, which method comprises (a) providing a substrate with at least one target region and at least one migration region, (b) applying a layer material, (c) adding a material selected from a recited group, and (d) performing a heat treatment such that the layer material migrates from the migration region to the target region.

As is well-settled, in order to establish a *prima facie* case of obviousness with respect to a claim, at least two criteria must be met: (1) the prior art references must suggest to one of ordinary skill in the art to make the subject matter defined by the claims in issue and (2) the prior art references must provide one of ordinary skill in the art with a reasonable expectation of success in so making the subject matter defined by the claims in issue. Both the suggestion and the reasonable expectation of success must be found in the prior art references, not in the disclosure of the patent application in issue. See, e.g., *In re Vaeck*, 947 F.2d 488, 493, 20 U.S.P.Q.2d 1438, 1442 (Fed. Cir. 1991).

The Office Action, however, fails (a) to identify anything that would have motivated one of ordinary skill in the art, at the time of invention, to combine the cited references in such a way as to arrive at the invention defined by the pending claims, and (b) to demonstrate that one of ordinary skill in the art would have had a reasonable expectation of success upon combination of the disclosures of the cited references.

As regards the modification to combine references, there must be a "clear and particular" teaching, suggestion, or motivation to combine the references. *In re Demiczak*,

PAGE 11/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

175 F.3d 994, 999 (Fed. Cir. 1999), *abrogated on other grounds* by *In re Gartside*, 203 F.3d 1305, 1316, 53 U.S.P.Q. 2d 1769, 1769-1770 (Fed. Cir. 2000); *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998); *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1051 (Fed. Cir. 1988). As noted by the Federal Circuit, "combining prior art references without evidence of such a suggestion, teaching or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability – the essence of hindsight." *In re Demiczak*, 175 F.2d at 999.

The Office Action acknowledges that the Li '982 publication fails to disclose or suggest that the metal in oxidized form may be a noble metal. The Li '982 publication is generally directed to a polishing method and composition for planarization of a substrate surface with reduced or minimal residual conductive material remaining from a polishing process (see the Li '982 publication at paragraph 0041). The residual conductive materials may include copper-containing materials such as copper, copper alloys, and doped copper as well as by-products of copper-containing materials, such as copper oxides (the Li '982 publication at paragraph 0041). The Li '982 publication further provides that the compositions and processes disclosed therein can additionally polish metal layers including layers comprised of metals and other materials, none of which include noble metals. Thus, the ordinarily skilled artisan, on being provided with the disclosure of the Li '982 publication, would not be motivated to utilize the compositions and methods of the Li '982 publication to polish layers comprising a noble metal or an oxidized form thereof, especially since it is well known in the art that noble metals are mechanically harder and more chemically resistant than most other integrated circuit conductor metals.

Although the Hartner '511 publication discloses that the method recited therein can comprise a chemical-mechanical planarization (CMP) step on a substrate comprising iridium oxide, the Hartner '511 publication is silent as to any of the details of the CMP step. As is well known in the art, there is no such thing as a general chemical-mechanical planarization method. Hundreds, if not thousands, of chemical-mechanical planarization methods are known in the art, for use in dozens of applications characterized by the specific composition of the substrate to be planarized. Nothing within the Hartner '511 publication could be construed to lead the ordinarily skilled artisan to select the method of the Li '982 publication from among the myriad possibilities already well known in the art. Indeed, the only connection between the cited references is the term "chemical-mechanical polishing."

PAGE 12/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

Absent any suggestions in the references themselves to combine their disclosures, an ordinarily skilled artisan given the Hartner '511 publication would not be led to the disclosure of the Li '982 publication, or vice versa, as alleged by the Office Action.

Moreover, even if the disclosures of the cited references were combined, there would have been no reasonable expectation of success. As discussed above, the Li '982 publication discloses a polishing composition comprising a reducing agent for the polishing of copper oxide, which is a metal in an oxidized form. The function of the reducing agent is to reduce a reduceable material, which is copper oxide in this reference, and thereby produce copper metal. The copper metal itself is then abraded by a combination of mechanical abrasion and chemical action of the other chemical components of the polishing composition, such as acids, complexing agents, and the like. Assuming *arguendo* that the ordinarily skilled artisan were motivated to look to the disclosure of the Li '982 publication for a polishing method for use in the polishing of a substrate comprising iridium oxide as disclosed in the Hartner '511 publication, the ordinarily skilled artisan could only be led to believe that the reducing agent present in the composition of the Li '982 publication would analogously reduce a reduceable material, which in such a situation would be iridium oxide, and thereby produce iridium metal. Copper and iridium differ vastly in their hardness. Copper has a Vickers hardness of 369 mN/m^2 and a Brinell hardness of 874 mN/m^2, whereas iridium has a Vickers hardness of 1760 mN/m^2 and a Brinell hardness of 1670 mN/m^2 (G.V. Samsonov (Ed.), *Handbook of the Physicochemical Properties of the Elements*, IFI-Plenum, New York, USA, 1968). Thus, the ordinarily skilled artisan would expect that application of the method of the Li '982 publication to the polishing of a substrate comprising iridium oxide would lead to the production of iridium metal, which is known as one of the hardest of all metals, having a Vickers hardness over four times that of copper and a Brinell hardness about twice that of copper. As a result, the ordinarily skilled artisan would not have a reasonable expectation of success in the application of the polishing composition of the Li '982 publication to the polishing of oxidized forms of noble metals.

For the foregoing reasons, the Office Action has failed to establish a proper *prima facie* case of obviousness for claims 1-3, 6-9, 13, 14, 16-18, 20, 21, 32-34, and 36-39. The Office Action has not identified a clear and particular suggestion or motivation in the prior art to combine the disclosures of the cited references (in the absence of hindsight knowledge of the present invention), and the Office Action has failed to establish that one of ordinary skill

PAGE 13/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

in the art would have a reasonable expectation of success upon the combination of the disclosures of the cited references.

Discussion of the Obviousness Rejection of Claims 10, 15, and 19

The Office Action asserts that claims 10, 15, and 19 are unpatentable over the Li '982 publication in view of the Hartner '511 publication and further in view of the Rosenflanz '822 patent.

The Li '982 publication and the Hartner '511 publication are discussed above with respect to claim 1. Nothing in the Rosenflanz '822 patent provides a motification to combine the disclosures of the Li '982 publication and the Hartner '511 publication, and nothing in the Rosenflanz '822 patent provides one of ordinary skill in the art with a reasonable expectation of success concerning a combination of the aforementioned references. As a result, the obviousness rejection of claims 10, 15, and 19 is improper for the same reasons set out above with respect to claim 1, on which claims 10, 15, and 19 are ultimately dependent.

Furthermore, claims 10, 15, and 19 specify that the chemical-mechanical polishing system comprises an abrasive suspended in the liquid carrier, wherein the abrasive is α-alumina. The Office Action relies on the Rosenflanz '822 patent for its disclosure of sol-gel derived α-alumina particles. Nothing in the Rosenflanz '822 patent, however, discloses or suggests that sol-gel derived α-alumina particles are particularly suited for use in a chemical-mechanical polishing method, let alone in a method for polishing a substrate comprising a metal in an oxidized form, wherein the metal is a noble metal, as recited in claims 10, 15, and 19. Rather, the Rosenflanz '822 patent merely mentions, by way of background, that the grinding performance of sol-gel derived abrasive particles on metal as measured, for example, by life of abrasive products made with the abrasive particles, was longer than such products made from conventional fused alumina abrasive particles. In view of the many demands made on the particular abrasive used in a chemical-mechanical polishing process, such as particle size, shape, dispersibility, purity, surface reactivity, and the like, it cannot be reasonably asserted that the life of the abrasive particle is a primary characteristic defining suitability of a given abrasive particle in a particular chemical-mechanical polishing process. Further, nothing within the Li '982 publication or the Hartner '511 publication teaches or suggests that alumina, let alone sol-gel α-alumina, is a preferred abrasive in a chemical-mechanical polishing process. Accordingly, except with the improper hindsight of the

PAGE 14/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

present invention, one of ordinary skill in the art would not be motivated to combine the cited references and would not have a reasonable expectation of success upon the combination of the disclosures of the cited references.

Indeed, the Rosenflanz '822 patent is not even analogous prior art suitable for combination with either the Li '982 publication or the Hartner '511 publication. The Rosenflanz '822 patent discloses that the fused eutectic abrasive particles disclosed therein can be used in conventional abrasive products, such as coated abrasive products, bonded abrasive products, nonwoven abrasive products, and abrasive brushes (see the Rosenflanz '822 patent at col. 16, lines 13-18). Although both the present invention and the Rosenflanz '822 patent are generally directed to abrading a surface, the differences between the polishing of delicate semiconductor substrates and the grinding applications suitable for the abrasive products of the Rosenflanz '822 patent are such that the ordinarily skilled artisan could not reasonably be expected to look to the grinding arts for guidance in the selection of desirable abrasives for use in a chemical-mechanical polishing process.

For the foregoing reasons, the Office Action has failed to properly establish a *prima facie* case of obviousness for claims 10, 15, and 19.

Discussion of the Obviousness Rejection of Claim 35

The Office Action further asserts that claim 35 is unpatentable over the Li '982 publication in view of the Hartner '511 publication and further in view of the Kaufman '489 patent.

The Li '982 publication and the Hartner '511 publication are discussed above with respect to claim 1. Nothing in the Kaufman '489 patent provides a motification to combine the disclosures of the Li '982 publication and the Hartner '511 publication, and nothing in the Kaufman '489 patent provides one of ordinary skill in the art with a reasonable expectation of success concerning a combination of the aforementioned references. As a result, the obviousness rejection of claim 35 is improper for the same reasons set out above with respect to claim 1, on which claims 10, 15, and 19 are ultimately dependent.

Furthermore, claim 35 specifies that the chemical-mechanical polishing system comprises a surfactant. The Kaufman '489 patent generally discloses a polishing slurry comprising at least two oxidizing agents, an organic acid, and an abrasive, wherein the polishing slurry can further comprise a surfactant, as well as the use of the polishing slurry to

PAGE 15/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

polish a substrate including at least one metal layer. The Kaufman '489 patent, however, does not teach or suggest that the polishing composition of the Li '982 publication can be modified by addition of a surfactant to polish a metal in an oxidized form, wherein the metal is a noble metal. Further, the disclosure of the Li '982 publication teaches a polishing composition comprising a *reducing* agent, whereas the disclosure of the Kaufman '489 patent teaches a polishing slurry comprising at least two *oxidizing* agents. Indeed, the Kaufman '489 patent teaches that in order to promote stabilization of a polishing slurry including *oxidizing* agents against settling, flocculation, and decomposition, a variety of optional additives, such as surfactants, stabilizers, or dispersing agents, can be used (see, e.g., the Kaufman '489 patent at col. 6, lines 39-42). Thus, the ordinarily skilled artisan, when considering a polishing composition comprising a *reducing* agent, would be led away from the disclosure of the Kaufman '489 patent inasmuch as the Kaufman '489 patent is directed to a polishing slurry containing *oxidizing* agents. The Hartner '511 publication does not dictate otherwise inasmuch as the Hartner '511 publication is silent as to any of the details of the chemical-mechanical polishing system process. Accordingly, except with the improper hindsight of the present invention, one of ordinary skill in the art would not be motivated to combine the cited references and would not have a reasonable expectation of success upon the combination of the disclosure of the cited references.

For the foregoing reasons, the Office Action has failed to establish a *prima facie* case of obviousness for claim 35.

Conclusion

The obviousness rejections are improper and should be withdrawn for the reasons discussed herein. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

PAGE 16/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30

Respectfully submitted,

John Kilyk, Jr., Reg. No. 30,763
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson Avenue
Chicago, Illinois 60601-6780
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: September 12, 2005

PAGE 17/17 * RCVD AT 9/12/2005 3:54:47 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-6/28 * DNIS:2738300 * CSID:312 616 5700 * DURATION (mm-ss):04-30